BIDIRECTIONALLY LOCKING SAFETY BRAKE APPARATUS FOR TREE CLIMBING LANYARDS AND OTHER TYPES OF LINES AND SAFETY CLIMBING LANYARD SYSTEM UTILIZING SAME

This application claims benefit under 35 USC 119(e) of the priority filing of U.S. Provisional application Serial No. 60/432,629 filed 12 December 2002.

BACKGROUND OF THE INVENTION

This invention relates primarily to encircling climbing lanyards such as those used by arborists in tree climbing, utility workers in climbing utility poles and the like, and more particularly to a locking safety brake cam apparatus therefor arranged to provide for continuous, unbroken safety interengagement of the climber and the tree-encircling lanyard during climbing and descending movement of the climber.

As is known by those skilled in the relevant art, persons that climb trees, utility poles and the like often use climbing lanyards in the form of ropes or straps which are arranged at their opposite longitudinal ends for quick release coupling to the connector mounts of a safety harness securely worn by the climber, the lanyard line typically having an overall length selected or adjusted to extend therefrom and encircle a tree or pole to be climbed. With the lanyard connected to the climber thusly, the user can, with spikes or other known foot securing climbing aids, climb the tree in successive upward steps, alternatingly sliding the lanyard further up the tree and taking new footholds in successive steps upward. However, as

line is encountered, in order to proceed further, the encircling lanyard line must be disconnected at one of its end connections to the safety harness so that the freed end can be trained over the branch and around the tree and then reconnected to the safety harness so that continued upward movement beyond the branch is possible.

However, during the entire time that the lanyard is partially disconnected from the safety harness worn by the climber, the climber is effectively completely untethered to the tree and entirely susceptible to falling. Not only must the climber contend with manipulating the lanyard line as needed in view of the obstructing branch, he must also be attentive in assuring that he has a safe and secure handhold against slipping or falling as well.

It is therefore obvious that a need exists in the marketplace for a safe and secure safety system to assure that a climber is continuously secured by tree encircling lanyard during climbing and descending even while navigating projecting branches and other obstructions.

SUMMARY OF THE INVENTION

In its basic concept this invention provides a bidirectionally locking safety brake apparatus arranged for connection at one of its ends to a climber's safety harness and at its opposite end midline on a substantially double length tree-encircling lanyard line connected at one of its ends to a climber's safety harness, whereby when climbing and descending, when an obstruction is encountered, the opposite free end portion of the lanyard line may be passed around the tree and obstruction and connected to the safety harness prior to disconnection of the first end portion of the lanyard line therefrom, whereby to continuously

secure the climber to the tree by the tree-encircling lanyard line.

It is by virtue of the foregoing basic concept that the principal objective of this invention is achieved; mainly, the provision of a safety lanyard line brake and safety climbing lanyard that overcomes the disadvantages and limitations of the prior art.

Another object of this invention is the provision of a lanyard safety brake apparatus that is arranged for selective locking engagement against movement on a rope or line in either opposite direction of travel therealong.

Yet another object of this invention is the provision of a bidirectionally locking safety brake apparatus and safety lanyard therefor that is of simplified construction for economical manufacture.

The foregoing and other objects and advantages of the present invention will appear from the following detailed description, taken in connection with the accompanying drawings of preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a first embodiment of a bidirectionally locking safety brake apparatus embodying features of the present invention.

Fig. 2 is an exploded, perspective view of the pivoting brake cam assembly of the safety brake apparatus if Fig. 1.

Fig. 3 is a side elevation of the safety brake apparatus with the facing wall of the U-shaped body removed to show internal detail, the brake cam assembly of the apparatus

shown in a neutral, non-locking condition for free sliding movement of a lanyard rope through the rope channel.

Fig. 4 is a side elevation similar to Fig. 3 but showing the brake cam assembly pivoted into frictional, binding locking engagement with the lanyard rope in each, opposite position of pivot of the assembly, as indicated in respective solid and broken lines.

Fig. 5 is an end view of the safety brake apparatus shown in neutral, non-locking condition relative to a rope-type lanyard line extending therethrough.

Fig. 6 is an end view of a second embodiment of a safety brake apparatus configured for use with strap-type lanyard lines, the apparatus shown in neutral, non-locking condition.

Figs. 7-9 are schematic top plan views illustrating a tree-encircling safety climbing lanyard system and climber's safety harness arrangement utilizing the bidirectionally locking safety brake apparatus of this invention and illustrating successive operational steps in passing branch obstructions while continuously securing a climber safely to the tree through the lanyard line.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1-5 illustrate a first embodiment of a safety brake assembly 10 embodying features of this invention and configured for use with a rope type, tree-encircling climbing lanyard as illustrated schematically in Figs. 7-9. As shown, the assembly comprises a substantially hollow, U-shaped outer body member 12 defining an open top end, a closed bottom end and generally open opposite lateral sides, an aligned bore 14 being provided

bottom end and generally open opposite lateral sides, an aligned bore 14 being provided through the opposite front and rear walls of the body member 12 intermediate the top and bottom ends thereof.

As seen best in Figs. 1 and 2, the outer body member 12 pivotally mounts a brake cam assembly 16 within its hollow interior cavity, the brake cam assembly embodied herein comprising a pair of substantially identical opposite cam members 18, 20 secured together as by interconnecting screws 22. As illustrated the confronting surfaces of each cam member are formed with a diametric segment of a specially configured mounting slot 24 having an enlarged inner end portion 26 extending inwardly from the top ends configured, when cam members 18, 20 are secured together, to rotatably capture a correspondingly configured mounting shaft 28, 30 projecting from the end of a mounting ring member 32. In this manner, the ring member 32 is secured rotatably to the cam member 16, providing a rotatable connector member for purposes which will become clear later.

Also seen best in Fig. 2, the brake cam assembly 16 includes a pivot bore 34 therethrough by which the brake cam assembly is mounted pivotally within the interior of the outer body member 12. In this regard, pivot bore 34 preferably has the same diameter as the diameter of aligned bores 14 through the outer body member walls for close reception therethrough of a mounting pivot pin 36. This pivot pin is preferably configured to prevent its unintentional separation from the body member while also configured to allow its intentional removal from the body member to permit intentional disassembly of the pivot cam assembly from the body member for installation of the safety brake assembly 10 onto a rope type

lanyard line intermediate its opposite terminal ends.

As is illustrated best in Figs. 3 and 4 of the drawings, the bottom end of the pivotal brake cam assembly 16 is configured with an arcuate base edge which terminates a predetermined spaced distance above the bottom closed end 12' of the outer body member 12 forming therebetween a longitudinally extending rope channel 38 configured for free passage of a rope R through the body member when the brake cam assembly 16 is disposed in the non-pivoted, neutral orientation illustrated in Fig. 3. As can be seen in comparing Figs. 3 and 4 of the drawings, the bottom edge of the cam member is configured so that the radius from the pivot 36 to the bottom edge increases from the central portion of the bottom edge outwardly in both opposite directions. This configuration provides a central slip surface for substantially free, unrestricted movement of the rope R in either direction through the channel 38 without binding interengagement with the brake cam when the latter is in the neutral, release condition of Fig. 3 and, as shown in Fig. 4, provides for frictional, binding or clamping interengagement of the brake cam against the rope when the brake cam assembly 16 is pivoted about mounting shaft 36 in either opposite direction by force applied to the ring member 32 in the corresponding direction, as is apparent in the drawing.

To facilitate and enhance positive, binding frictional engagement of the rope by the brake cam, the bottom edge of the brake cam assembly preferably, as illustrated, includes means for increasing frictional interengagement with the rope, such as by the provision of roughened surfaces such as serrations or projecting ribs 40 arranged to provide a biting or gripping contact with the rope and thereby eliminate slippage therebetween when the brake

cam is pivoted into locking engagement in either directions from the central, neutral condition. Additionally, the inner surface of the closed end 12' of the outer body member 12 may be provided with inwardly projecting humps 42 to provide raised surface abutments against the side surface of the rope opposite the projecting ribs 40 of the brake cam assembly whereby to effectively crimp the rope therebetween for increased protection against slippage of the rope when engaged by the brake cam assembly.

Fig. 6 illustrates a second embodiment of the safety brake assembly of this invention arranged for use with a strap type lanyard line S. In this regard, the only significant change to the structures previously described in connection with the first embodiment is that the outer body member 44 in this embodiment is provided with a bottom end portion 44' configured to form an inner strap-receiving channel 46 arranged for sliding passage of a selected lanyard strap S therethrough when the brake cam assembly 16 is in its neutral, non-locking condition and for binding engagement of the strap S by the locking portions of the brake cam when the latter is pivoted in either one of its opposite directions into binding, locking interengagement with the strap, as has been discussed hereinbefore in connection with the previous embodiment of the safety brake assembly.

Having thus described the safety brake apparatus, its operation will now be described in connection with a preferred tree-encircling safety lanyard system as illustrated schematically in Figs. 7-9 of the drawings. In this regard, a tree T is shown with an outwardly projecting branch B providing an obstruction to the normal passage of a tree-encircling climbing lanyard line L in use. As is well understood in the art, a safety harness 48 is securely worn by a

climber (not shown), the safety harness typically mounting a pair of connector members 50, 52 normally provided for receiving corresponding quick release mounting fixtures secured to the opposite terminal ends of a conventional tree encircling climbing lanyard line (not shown) whereby to safely secure the climber against falling away from the tree by the tree-encircling lanyard.

In similar manner, the safety brake lanyard system of this invention also provides the opposite terminal ends of a lanyard line L with quick release coupler members 54, 56 (illustrated herein as carabiners or snap rings) for secure but facilitated connection to and disconnection from a selected one connector member 50 of the safety harness as will be explained. Unlike conventional tree-encircling lanyard lines however, the lanyard line L of the present invention has an overall length that is substantially at least double the length required to extend from the safety harness connectors 50, 52 and around the tree for reasons which will soon become clear.

As shown in Fig. 7, the safety brake apparatus 10 described hereinbefore is installed on the lanyard line L intermediate its opposite terminal ends at approximately the mid point of the lanyard line. As explained previously, this is accomplished by removing the mounting pivot pin 36, removing the brake cam assembly 16 from the outer body member 12, inserting the body member in overlying condition on the lanyard line and then reassembling the brake cam member and mounting pivot pin. With the safety brake apparatus 10 thus installed on the lanyard line, the lanyard line is effectively divided into a first section L' extending in one direction from the safety brake apparatus 10 and a generally equal length, second section L"

extending in the opposite direction from the safety brake apparatus.

With the safety brake assembly 10 thus mounted on the lanyard line L intermediate its opposite terminal ends, a carabiner 58, snap ring connector or other suitable safety connector is attached to the mounting ring member 32 that is rotatably secured to the brake cam16, the connector 58 then connected to a selected connector mount 52 of the safety harness worn by the climber. The first section L' of the lanyard is then passed around the tree and its terminal end connected by coupler 54 to the connector mount 50 on the climber's safety harness. The length of the lanyard section L' may then be adjusted as desired by pulling the line through the safety brake channel while the brake cam is in its non-pivotal, neutral, non-binding condition of Fig. 3. The climber may then begin climbing the tree using the tree-encircling lanyard in normal manner (with the second lanyard section L" depending downwardly from the brake assembly 10 freely by gravity). As will be understood, whenever the climber's body applies outward tension against the lanyard line through its connections 54, 58 to the safety harness 48, the force of that outward tension is applied to the ring member 32 which in turn pivots the brake cam 16 into locking, binding engagement with the lanyard line, as is evident in viewing Fig. 7.

When the climber meets with an obstruction to continued upward movement of the tree trunk-encircling lanyard along the tree, such as an outwardly projecting branch B extending from the tree trunk, he simply grabs the free, second lanyard section L" and passes it above the obstructing branch and around the tree trunk as shown in Fig. 8, and then connects the coupler 56 on the terminal end of the second lanyard section L" to the same

connector mount 50 to which the first lanyard section L' is connected. The length of the now connected second lanyard section L" may be adjusted by the climber leaning forward to remove outward tension against the ring member 32, thereby allowing the brake cam to move into its neutral condition and permit the lanyard line to be moved freely until a desired length adjustment of the second lanyard line section L" is achieved. The climber may then lean back against the lanyard, which is now the operatively adjusted second lanyard line section L", thereby applying tension on the ring member 32 and pivoting the brake cam in the reverse direction into locking engagement with the line extending through the safety brake apparatus 10. The coupler 54 on the end of the now loosened first lanyard line section L' is disconnected from its connection 50 to the safety harness as seen in Fig. 9, whereupon the now out-of-use lanyard section L' simply falls by gravity into a condition freely depending from the end of the safety brake assembly 10. The climber may then proceed to climbing vertically until the aforementioned process needs to be repeated with successive obstructions that are encountered during continued climbing alternatively using lanyard sections L' and L" with successive obstructions as is apparent, and of course in the reverse of the aforementioned procedure during descending movement of the climber down the tree.

As will be readily apparent, since the lanyard line sections L' and L" extend outwardly in opposite directions from the safety brake assembly 10, the safety brake apparatus must be capable of rotating on its mount to the safety harness in order for each lanyard section L', L" to move as needed to extend forwardly from the climber toward and about the tree when the respective lanyard line section L' or L" is being operatively used as a supporting lanyard line. It

is for this reason that the mounting connection (24-30) of the ring member 32 on the safety brake cam 16 is a rotatable connection. Also, since as just mentioned the lanyard line sections L', L" are alternatingly used to encircle the tree and thereby support a climber, the safety brake assembly of this invention must be arranged to lockably engage the lanyard line alternatingly in each direction according to which outwardly extending lanyard line section L', L" is being used. It is for this reason that the safety brake assembly is particularly configured for releasable locking interengagement with a lanyard line in each opposite direction, with an intermediate, neutral, non-locking function therebetween to permit adjustment of the respective lanyard line sections being used.

From the foregoing it will be apparent to those skilled in the art that various changes other than those previously discussed may be made in the size, shape; type, number and arrangement of parts described hereinbefore without departing from the spirit of this invention and the scope of the appendent claims.

Having thus described my invention and one manner in which it may be used, I claim: